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EXAMINER

DUNLAP, JONATHAN M

ART UNIT

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

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<b>Office Action Summary</b>	Application No. 10/560,995	Applicant(s) MORIMOTO, HIDEO	
	Examiner Jonathan Dunlap	Art Unit 2855	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 December 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11, 13-17 and 19-24 is/are rejected.
- 7) ☐ Claim(s) 12 and 18 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>December 16, 2005</u>   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Priority*

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### *Specification*

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 1-2, 7-9, 13-15, 19-20 and 22-23** are rejected under 35

U.S.C. 102(b) as being anticipated by **JP-2581820**, hereafter **Kabushiki**.

Considering claim 1, Kabushiki discloses a 6-axis sensor for measuring 6-axis forces and moments or 6-axis accelerations and angular accelerations;

externally applied, characterized by comprising: a plurality of strain gauges **44,45,46 (a,b)** disposed on one plane (**Figure 3; Page 5, lines 29-40**).

Considering claim 2, Kabushiki discloses a first diaphragm **11** to which the plurality of strain gauges **44,45,46 (a,b)** are attached (**Figures 3-4; Page 5, lines 36-40**).

Considering claim 7, Kabushiki discloses that a thin portion of each first diaphragm **11** is annular and provided with eight strain gauges (**connecting 32 and 11 at center**), and the strain gauges are disposed at outer and inner edge portions of the first diaphragm **11** on a line extending between a central point of the first diaphragm **11** and the central point **32** of the plane, and at outer and inner edge portions of the first diaphragm **11** on a line perpendicular to the former line at the central point of the first diaphragm **11** (**Figure 1**).

Considering claim 8, Kabushiki discloses an operative body **32** provided on a central portion of the first diaphragm **11**, and 6-axis accelerations and angular accelerations applied to the 6-axis sensor are measured (**Figure 2; Page 4, lines 12-24**).

Considering claim 9, Kabushiki discloses:

- A first member comprising the first diaphragm **11** (**Figure 9; Page 2, lines 43-49**);
- A second member comprising a second diaphragm **22,23** opposed to the first diaphragm and provided with no strain gauges (**Figure 9; Page 2, lines 43-49**); and

- A connecting shaft **13** connecting the opposed first **11** and second diaphragms **22,23**, and 6-axis forces and moments applied between the first and second members are measured (**Figure 9; Page 2, lines 47-49**).

Considering claim 13, Kabushiki discloses that only one diaphragm **11** is disposed on the plane (**Figures 1 and 3**).

Considering claim 14, Kabushiki discloses operative bodies **41\*** being in contact with the first diaphragms **11** at positions arranged around the central point of the plane at regular angular intervals and at the same distance from the central point, and 6-axis accelerations and angular accelerations applied to the 6-axis sensor are measured (**Figure 4; Page 5, lines 29-40**).

Considering claim 15, Kabushiki discloses:

- A first member comprising the first diaphragm **11** (**Figure 9; Page 2, lines 43-49**);
- A second member comprising a second diaphragm **22,23** opposed to the first diaphragm and provided with no strain gauges (**Figure 9; Page 2, lines 43-49**); and
- Operative bodies **41\*** connecting the first **11** and second diaphragms **22**, the first and second members are disposed so that a central point of the first diaphragm of the first member is opposed to a central point of the second diaphragm of the second member, and the operative bodies connects the first and second diaphragms at positions arranged around the central points of the first and

second diaphragms at regular angular intervals and at the same distance from the central points, and 6-axis forces and moments applied between the first and second members are measured **(Figure 3; Page 5, lines 20-40)**.

Considering claim 19, Kabushiki discloses that the angular interval is 90 degrees **(Figure 3)**.

Considering claim 20, Kabushiki discloses that the operative bodies **41\*** are disposed in positive and negative directions on X and Y axes with an origin being defined at the central point of the first diaphragm **11 (Figure 3)**.

Considering claim 22, Kabushiki discloses strain gauges disposed:

- At edge portions of the operative bodies on a line extending between a central point of a portion on the plane corresponding to the operative bodies, and the central point of the first diaphragm **(Figure 3)**;
- At edge portions of the operative bodies on a line perpendicular to the former line at the central point of the portion on the plane corresponding to the operative bodies **(Figure 3)**; and
- At either of edge portions of the operative bodies and edge portions of the first diaphragm, at positions arranged around the central point of the first diaphragm at regular angular intervals and at the same distance from the central point **(Figure 3)**.

Considering claim 23, Kabushiki discloses that each of the strain gauges is made of a piezoresistance element **(Page 1, lines 3-5)**.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 3-5** are rejected under 35 U.S.C. 103(a) as being unpatentable over **JP-2581820**, hereafter **Kabushiki** in view of **Okada (JP 10-132668A)**.

The invention by Kabushiki fails to disclose that the first diaphragms are arranged around a central point of the plane at regular angular intervals and at the same distance from the central point, wherein the angular intervals are 90 degrees and the diaphragms are positioned in positive and negative X and Y axes with an origin being defined at the central point.

5. However, Okada teaches:

Considering claim 3, that the first diaphragms **101** are arranged around a central point of the plane at regular angular intervals and at the same distance from the central point (**Figures 9**).

Considering claim 4, Kabushiki discloses that the angular intervals are 90 degrees (**Figure 9**).

Considering claim 5, Kabushiki discloses that the diaphragms **101** are disposed in positive and negative directions on X and Y axes with an origin being defined at the central point (**Figures 9**).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to position multiple diaphragms around a central point of a plane at regular intervals, specifically 90 degrees, while positioning the diaphragms in positive and negative X and Y axes directions as taught by Okada in the invention by Kabushiki. Kabushiki discloses eight regularly spaced interconnected diaphragms while Okada teaches separate diaphragms. The motivation for separating the interconnected diaphragms is to allow for multiple multi-axis sensors to be formed on a single substrate as found in the teachings of Okada ([0001]; [0013-18]). Similarly, the motivation for duplicating the single diaphragm sensor of Kabushiki is to allow for multiple multi-axis sensors to be formed on a single substrate as found in the teachings of Okada ([0001]; [0013-18]).

6. **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over **JP-2581820**, hereafter **Kabushiki** in view of **Okada (JP 10-132668A)** and further in view of **Watson et al. (U.S. Patent 4,094,192)**.

The invention by Kabushiki, as modified by Okada, fails to disclose that the angular interval is 120 degrees.

7. However, Watson discloses evenly spaced intervals of 120 degrees (**Figure 2**).

Therefore, it would have been obvious to one of ordinary skill in the art to use an evenly spaced interval of 120 degrees as taught by Watson in the invention by Kabushiki, as modified by Okada. The motivation for doing so is found in the teachings of Watson, "it is desirable that the strain gauges are so

placed that no one component of input force be favored over other components in terms of the magnitude of strain gauge response to a unit load” (**Column 3, lines 21-25**). Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made because the teachings of Watson as combined with the disclosure of Kabushiki would necessitate fewer strain gauges, thus reducing the number of components required to be manufactured into the sensor which ultimately would reduce manufacturing costs.

8. **Claims 10-11 and 16-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over **JP-2581820**, hereafter **Kabushiki** in view of **EP 1 284 055**, hereafter **Datex**.

Considering claims 10 and 16, the invention by Kabushiki fails to disclose that the second member comprising a second diaphragm comprises a plurality of strain gauges.

9. However, Datex teaches a second member comprising a second diaphragm provided with a plurality of strain gauges disposed on one plane (**Figure 1 and 2; Page 1, lines 47-56**).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a second diaphragm comprising a plurality of strain gauges connected coaxially with the first diaphragm as taught by Datex in the invention by Kabushiki. The motivation for doing so is found in the teachings of Datex, “a further particular advantage resides in the fact that the circular symmetry of the transducer renders response independent of the

direction of application of forces...[accordingly] the invention can be made highly sensitive and accurate" (**Page 1, lines 67-73**).

Considering claim 11 and 17, the invention by Kabushiki fails to disclose that the strain gauges of the first and second diaphragms are disposed symmetrically with respect to a barycentric point of the 6-axis sensor.

10. However, Datex teaches strain gauges symmetrically disposed about a barycentric point of the 6-axis sensor (**Figures 1 and 2**).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to disposed strain gauges symmetrically about a barycentric point of the sensor as taught by Datex in the invention by Kabushiki. The motivation for doing so is found in the teachings of Datex, "a further particular advantage resides in the fact that the circular symmetry of the transducer renders response independent of the direction of application of forces...[accordingly] the invention can be made highly sensitive and accurate" (**Page 1, lines 67-73**). Furthermore, the opposing strain gauges endure equal temperature adjustment, and therefore, the effect of temperature variation can be negated (**Datex, Page 1, lines 62-67**).

11. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over **JP-2581820**, hereafter **Kabushiki** in view of **Watson et al. (U.S. Patent 4,094,192)**.

The invention by Kabushiki fails to disclose that the angular interval is 120 degrees.

12. However, Watson discloses evenly spaced intervals of 120 degrees (**Figure 2**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an evenly spaced interval of 120 degrees as taught by Watson in the invention by Kabushiki. The motivation for doing so is found in the teachings of Watson, "it is desirable that the strain gauges are so placed that no one component of input force be favored over other components in terms of the magnitude of strain gauge response to a unit load" (**Column 3, lines 21-25**). Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made because the teachings of Watson as combined with the disclosure of Kabushiki would necessitate fewer strain gauges, thus reducing the number of components required to be manufactured into the sensor which ultimately would reduce manufacturing costs.

13. **Claim 24** is rejected under 35 U.S.C. 103(a) as being unpatentable over **JP-2581820**, hereafter **Kabushiki** in view of **JP-2838361**, hereafter **Osaka-Fu**.

The invention by Kabushiki fails to disclose that the strain gauges are made of a thin film of chromium oxide formed on an insulating film.

14. However, Osaka-Fu teaches that each of the strain gauges is made of a thin film of chromium oxide formed on an insulating film (**[0013-15]**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use strain gauges made of chromium oxide formed on an insulating film as taught by Osaka-Fu in the invention by Kabushiki. The motivation for doing so is to generate a low temperature coefficient of resistance and high gauge factor as found in the teachings of Osaka-Fu ([0017]).

### ***Allowable Subject Matter***

Claims 12 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter, the prior art made of record fails to disclose or suggest selecting which set of strain gauges to use based on a predetermined range of acceptable values.


### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art made of record show various embodiments of 6-axis sensors with a plurality of strain gauges on a single plane.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Dunlap whose telephone number is (571) 270-1335. The examiner can normally be reached on M-F 8-5 with every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Lefkowitz can be reached on (571) 272-2180. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Jonathan Dunlap  
Examiner  
AU 2855  
June 19, 2007



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